Trubhuvan University

Bachelor of Science in Computer Science and Information Technology

Course Title: Introduction to Artificial Intelligence

Course No.: CSC 304   **Full Marks:** 60+20+20

Credit hours: 3   **Pass Marks:** 24+8+8

Nature of Course: Theory (3 Hrs.) + Lab (3 Hrs.)

Course Synopsis: This course introduces the problem solving techniques, problem representation & machine learning.

Goal: The main objective of the course is to provide basic knowledge of Artificial Intelligence with acquaintance of different search techniques and AI applications.

Course Contents:

Unit 1: Introduction to Artificial Intelligence

Artificial Intelligence and related fields, brief history of AI, applications of AI, Definition & importance of knowledge & learning, Agent & its type and performance measures.

Unit 2: Problem Solving

Problem definition, problem as a state space search, problem formulation, problem types: Tor problems, Real world problems, Well-defined problems, Constraint satisfaction problem (Basic concept & examples), Production systems (Definition, Architecture, examples).

Unit 3: Search Techniques

Uniformed search techniques: depth first search, breadth first search, depth limit search, Iterative deepening search, Bidirectional search, & search strategy comparison. Informed search techniques: Greedy best first search, A* search, Hill climbing search, Simulated annealing, Game playing, Adversarial search techniques-mini-max procedure, alpha beta pruning.

Unit 4: Knowledge Representation, Inferential reasoning

Formal logic connectives, truth table, syntax, semantics, tautology, validity, well-formed formula, propositional logic, Inference with PL: Resolution, Backward chaining & Forward chaining, predicate logic (FOPL), quantification, inference with FOPL by converting into PL (Existential & Universal instantiation), Directly with FOPL. (Unification & lifting, resolution, backward chaining, forward chaining), Rule based deduction system, Statistical reasoning-probability & Bayes theorem & causal networks, reasoning in belief network.

Unit 5: Structured Knowledge Representation

Representation and mappings, Approaches to knowledge representation, Issues in knowledge representation, Semantic nets, Frames, Conceptual dependencies and scripts (Rich and Knight).

Unit 6: Machine Learning

Concepts of learning, learning from examples, explanation based learning, learning by analogy, learning by simulating evolution, learning by training neural nets, learning by training perceptions.

Unit 7: Applications of Artificial Intelligence

Expert system (Architecture, Expert system development process), Neural Network (Mathematical model, get realization, Network structure), natural language processing (Steps of NLP parsing), Basic concepts of Machine vision.

Laboratory Work:

Laboratory exercises should be conducted in either LISP or PROLOG. Laboratory exercises must cover the fundamental search techniques, concept of knowledge representation.

Text/Reference Books:

- E. Rich and Knight, Artificial Intelligence, McGraw Hill.
- D.W. Patterson, Artificial Intelligence & Expert Systems, Printice Hall.
- P.H. Winston, Artificial Intelligence, Addison Wesley.
- Stuart Rusel and Peter Norvig, Artificial Intelligence A Modern Approaches, Pearson
- Ivan Bratko, PROLOG Programming for Artificial Intelligence.